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(54) **SYSTEM AND METHOD TO PROVIDE BUNDLED SERVICES THROUGH A COMMUNICATION DEVICE**

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(52) **U.S. Cl.**  
USPC ..... **370/463**

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See application file for complete search history.

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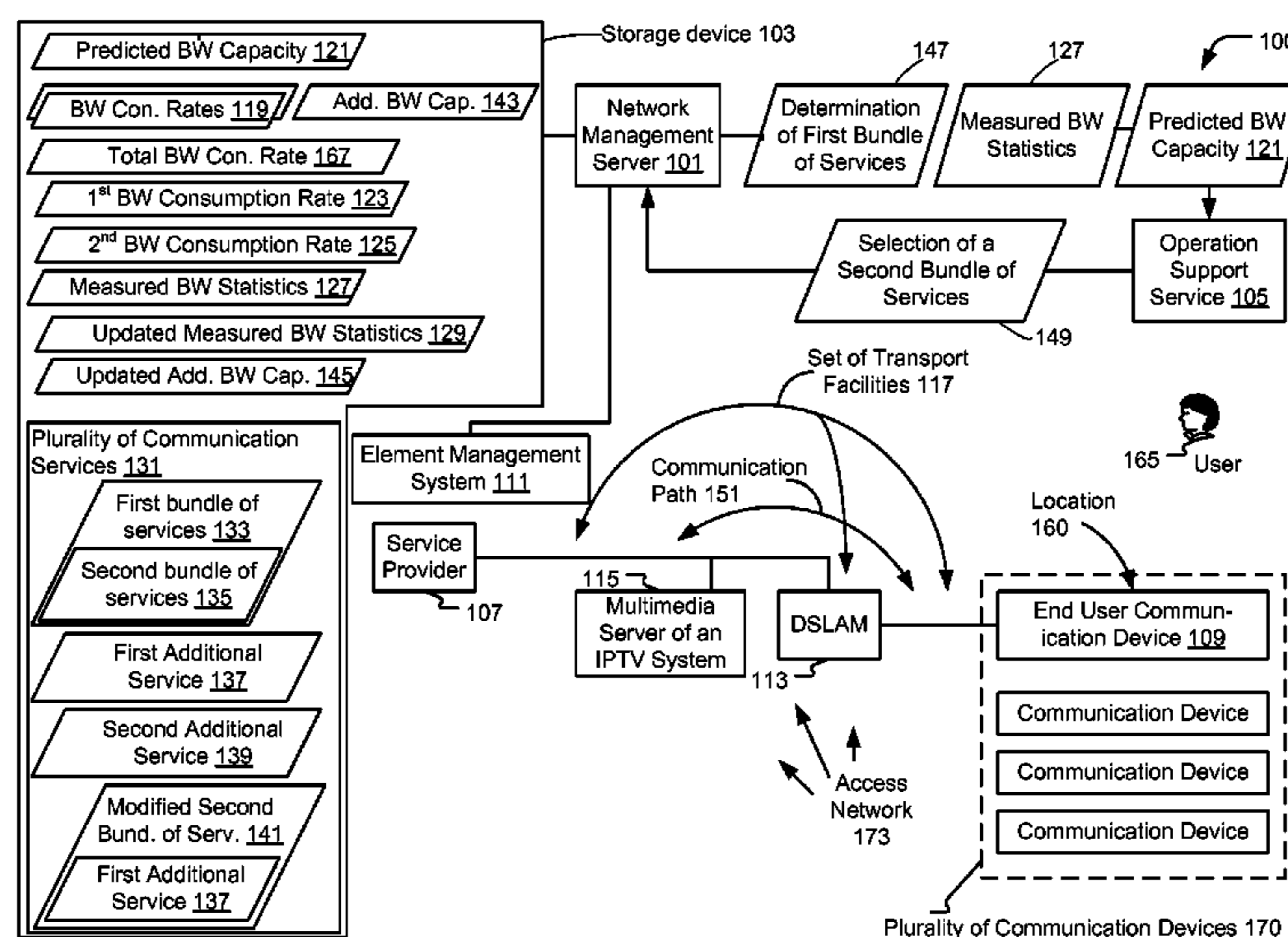
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(57) **ABSTRACT**

Systems and method to provide bundled services through a communication device. A particular method may include determining a first bundle of services to offer a user of an end user communication device, where the first bundle of services has a total bandwidth consumption rate computed based on stored bandwidth consumption rates corresponding to services within the first bundle of services. The total bandwidth consumption rate is less than a predicted bandwidth capacity. The particular method may also include comparing a predicted bandwidth capacity to measured bandwidth statistics to identify an additional bandwidth capacity of a set of transport facilities and determining a first additional service to offer a user of the end user communication device to utilize the additional bandwidth capacity.

**20 Claims, 4 Drawing Sheets**



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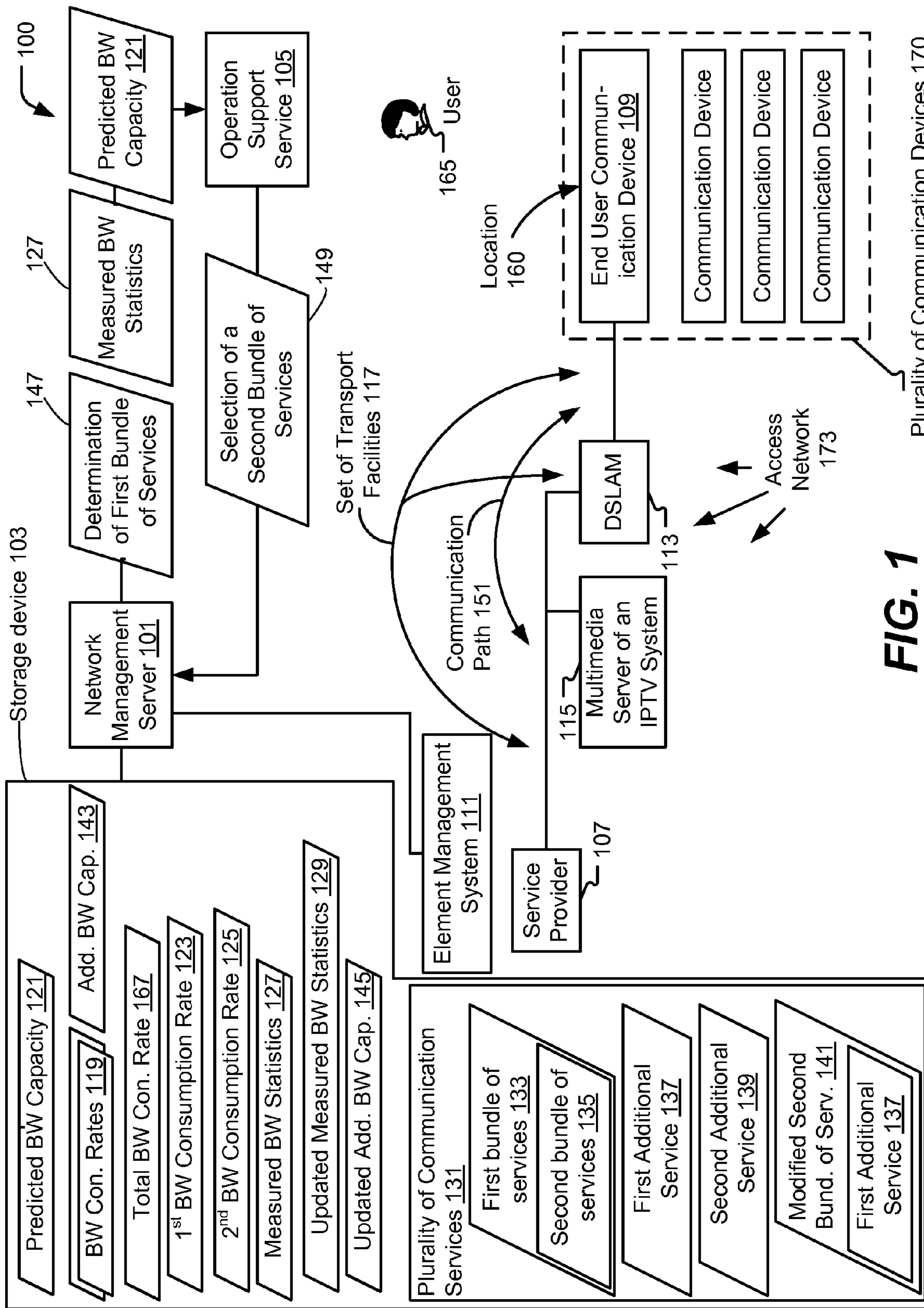


FIG. 1

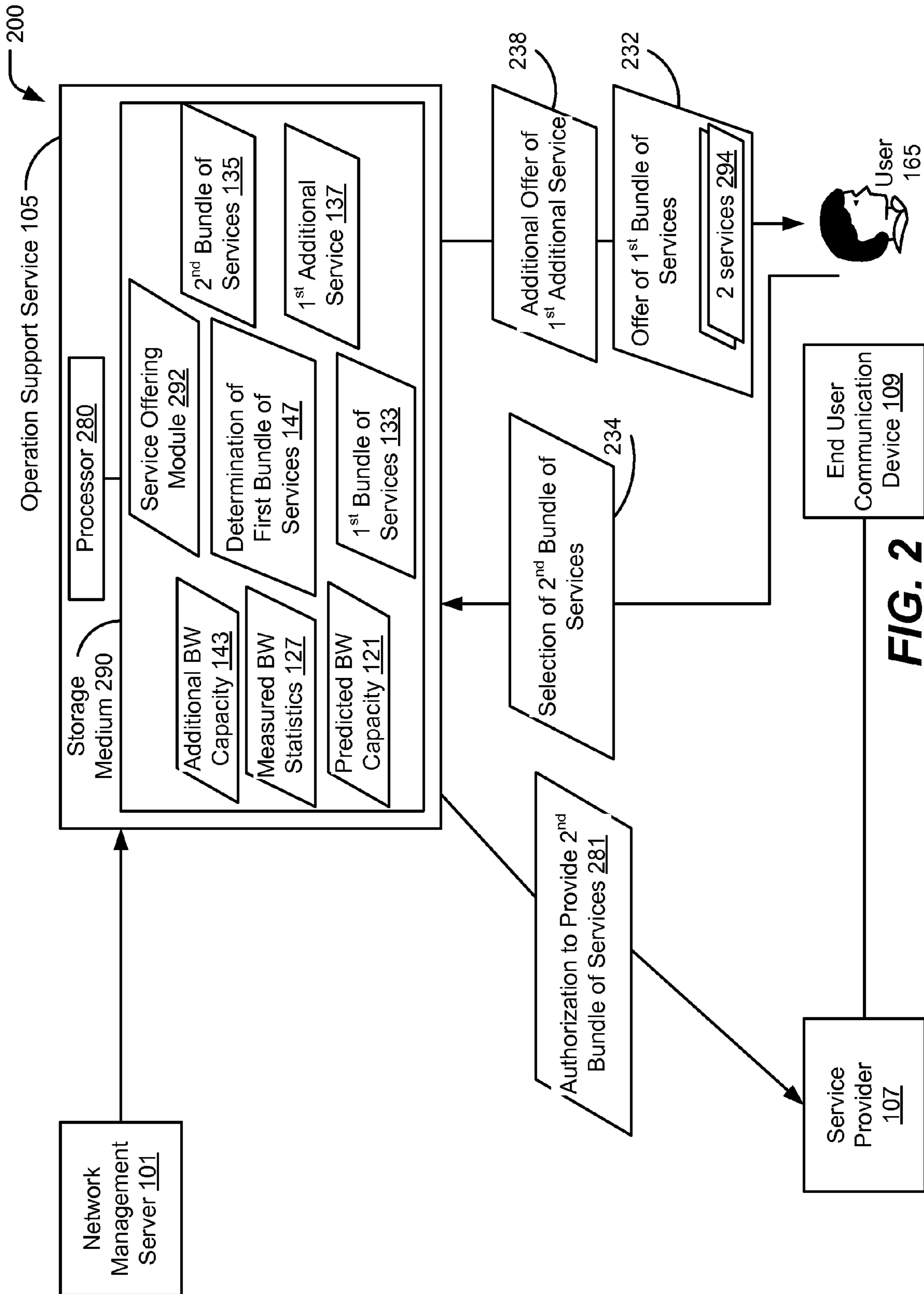
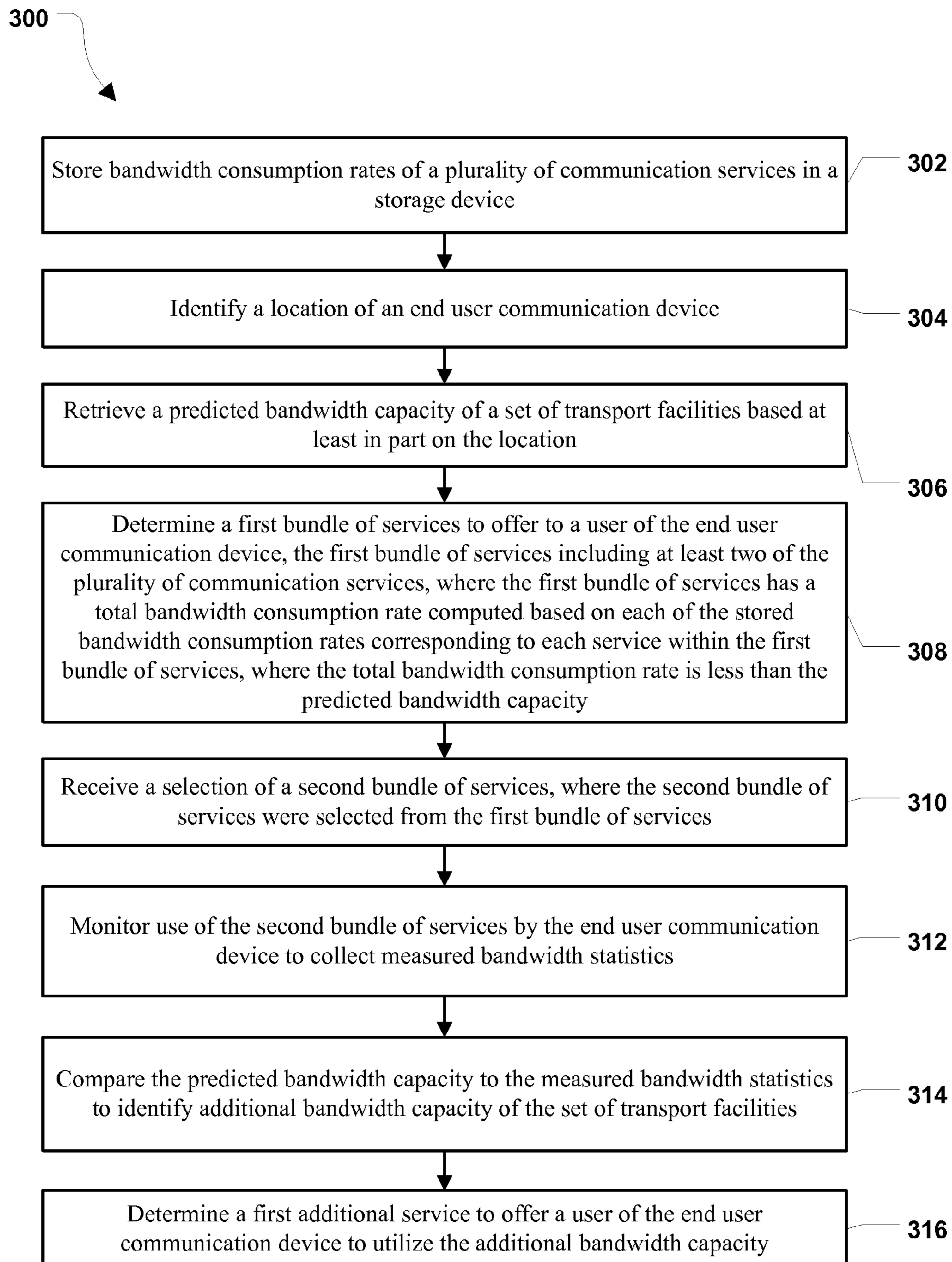


FIG. 2



**FIG. 3**

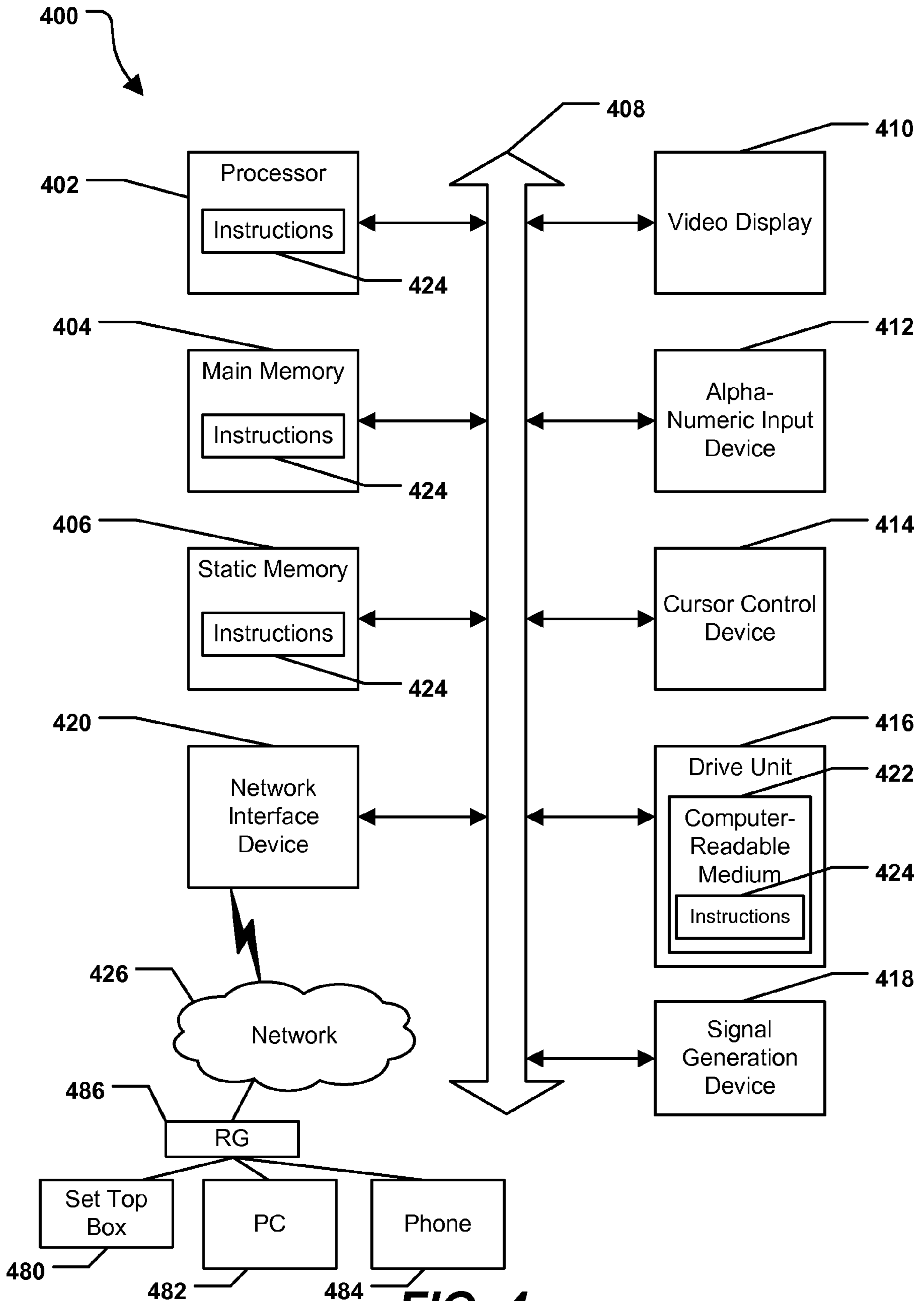


FIG. 4



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## SYSTEM AND METHOD TO PROVIDE BUNDLED SERVICES THROUGH A COMMUNICATION DEVICE

### FIELD OF THE INVENTION

The present disclosure relates generally to providing bundled services through a communication device.

### BACKGROUND

In traditional digital subscriber line (DSL) service offerings, a service provider offers a subscriber a selected physical connection. The subscriber is then offered services that are capable of being provided over the selected physical connection. By offering services based on the previously selected physical connection, the selected physical connection may not be tailored to match the requirements of the services that the subscriber uses.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram of a first embodiment of a system to provide bundled services through a communication device;

FIG. 2 is a diagram of a second embodiment of a system to provide bundled services through a communication device;

FIG. 3 is a flow diagram of a method to provide bundled services through a communication device; and

FIG. 4 is a diagram of an illustrative embodiment of a general computer system.

### DETAILED DESCRIPTION

In a particular embodiment, a method is disclosed that includes storing bandwidth consumption rates of a plurality of communication services at a storage device. The method includes identifying a location of an end user communication device. The method also includes retrieving a predicted bandwidth capacity of a set of transport facilities based at least in part on the identified location. The method also includes determining a first bundle of services to offer to a user of the end user communication device. The first bundle of services includes at least two of the plurality of communication services. The first bundle of services has a total bandwidth consumption rate computed based on each of the stored bandwidth consumption rates corresponding to each service within the first bundle of services. The total bandwidth consumption rate is less than the predicted bandwidth capacity. The method includes receiving a selection of a second bundle of services. The second bundle of services is selected from the first bundle of services. The method also includes monitoring use of the second bundle of services by the end user communication device to collect measured bandwidth statistics. The method includes comparing the predicted bandwidth consumption to the measured bandwidth statistics to identify additional bandwidth capacity of the set of transport facilities. The method also includes determining a first additional service (or an enhanced version of a current service) to offer the user of the end user communication device to utilize the additional bandwidth capacity.

In another particular embodiment, a system is disclosed that includes a set of transport facilities to enable communication between a service provider and an end user communication device. A user of the end user communication device may be offered a first bundle of services that the service provider is capable of providing to the end user communication device. Each service in the first bundle of services may

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have a different bandwidth requirement. Based on the services that the user selects from the offer of the first bundle of services, the system selects which of the available transport facilities will be utilized to provide the user selected services.

5 The selection of the transport facilities is based at least partially on the bandwidth requirements of the selected services. The system may monitor the use of the selected services to determine an additional bandwidth capacity of the transport facilities. Additional services or enhanced services may be offered to the user based on the additional bandwidth capacity.

Referring to FIG. 1, a first particular embodiment of a system to provide bundled services through a communication device is depicted and generally designated 100. The system 100 includes an operation support service 105 coupled to a network management server 101. The network management server 101 is coupled to a storage device 103 and to an element management system (EMS) 111. The system 100 also includes a service provider 107 that is coupled to a multimedia server 115, a digital subscriber line access multiplexer (DSLAM) 113, and an end user communication device 109 via a set of transport facilities 117. The set of transport facilities 117 may include a communication path, such as, fiber to the node (FTTN), fiber to the curb (FTTC), fiber to the home (FTTH), other wireless or wireline transport components, or any combination thereof. The set of transport facilities 117 may be within an access network 173 that couples the multimedia server 115 of the IPTV system to a plurality of communication devices 170. In a particular embodiment, the service provider 107 is coupled to other systems, such as an Internet Protocol Multimedia subsystem (IMS) that enables the service provider 107 to provide voice and internet access to subscribers.

The system 100 enables a user 165 of the end user communication device 109 to select a second bundle of services 135 from a first bundle of services 133 based on a predicted bandwidth capability 121 of the set of transport facilities 117. After use of the selected second bundle of services 135 by the end user communication device 109, one or more additional services may be offered to the user 165. The offer of the one or more additional services may be based on a measure of additional bandwidth available. By offering an initial set of services to the user 165 based on predicted bandwidth capacity 121 and offering additional services based on measured bandwidth statistics 127, the service provider 107 may be able to increase revenue by providing more services via the set of transport facilities 117.

In a particular embodiment, the service provider 107 may include one or more servers and other devices configured to provide multimedia, telephony, or other packet-based content to one or more of the plurality of communication devices 170. The service provider 107 may be responsive to the network management server 101 to provide selected bundles of services to the individual communication devices of the plurality of the communication devices 170 via the set of transport facilities 117. The service provider 107 may receive data from the network management server 101 indicating which particular communication device (e.g., end user communication device 109) is to receive which bundle of services. The service provider 107 may be configured to enable or disable transmission of multimedia data to the plurality of communication devices 170 based on selected services and to provide service authorization information to the multimedia server 115.

In a particular embodiment, the multimedia server 115 may be configured to receive requests for multimedia access from one or more communication devices (e.g. the end user com-



munication 109). The multimedia server 115 may verify the request for multimedia access and may provide the requested multimedia data via the access network 173. For example, the end user communication device 109 may request a streaming multimedia program, such as an internet protocol television (IPTV) program to be received at the end user communication device 109. In response, the multimedia server 115 may determine whether the end user communication device 109 is authorized to receive the program and may initiate streaming multimedia delivery to the end user communication device 109 when the end user communication device 109 is authorized to receive the program. As another example, the end user communication device 109 may request additional services, such as voice and internet service, via the set of transport facilities 117. In response, the service provider 107 may determine whether the end user communication device 109 is authorized to receive the additional service (e.g., the first additional service 137) and may initiate provisioning of the additional service to the end user communication device 109. The service provider 107 may be connected with an IMS to provide the additional service. In a particular embodiment, the multimedia server 115 is configured to stream multimedia data via the access network 173, such as via one or more multicast transmissions, unicast transmissions, or a combination thereof. The IPTV system may include the access network 173 that includes the set of transport facilities 117.

The access network 173 may include one or more multimedia communication devices or equipment, such as one or more routers, bridges, servers, or other network messaging and management devices. In a particular embodiment, the access network 173 includes the digital subscriber line access multiplexer (DSLAM) 113. The DSLAM 113 may be configured to provide a multiplexing functionality to the access network 173, such as for broadcast or multicast multimedia distribution. The access network 173 may include a packet-switched network, such as an Internet Protocol (IP) network. The access network 173 may include one or more wireline or wireless network components. For example, the access network 173 may include a Bluetooth, Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi) network, a wireless local area network (WLAN) network, one or more other networks, or any combination thereof. In a particular embodiment, the access network 173 enables distribution of multimedia content from the multimedia server 115 to the plurality of communication devices 170.

In a particular embodiment, the end user communication device 109 may be a device that is configured to receive requests for content from the user 165 and to provide a request to the service provider 107 via the access network 173. The end user communication device 109 may be configured to receive multimedia data via the access network 173 and to provide the multimedia data for display or consumption by the user 165. For example, the end user communication device 109 may include a set top box device, a mobile handset, a personal digital assistant (PDA), a portable television, a laptop computer, a smart book or net book, any other portable electronic device or stationary electronic device configured to receive multimedia data, or any combination thereof.

In a particular embodiment, the network management server 101 is configured to manage operations within the system 100. For example, the network management server 101 may be configured to access the storage device 103 to receive information from one or more components of the system 100 and to communicate with the operation support service 105.

In a particular embodiment, the storage device 103 may be configured to store information and parameters related to the

network management of the system 100. For example, the storage device 103 may include data corresponding to a predicted bandwidth capacity 121, an additional bandwidth capacity 143, a first bandwidth consumption rate 123, an updated additional bandwidth capacity 145, a second bandwidth consumption rate 125, a total bandwidth consumption rate 167, and bandwidth consumption rates 119 of a plurality of communication services 131. The storage device 103 may also include data corresponding to measured bandwidth statistics 127, updated measured bandwidth statistics 129, and the plurality of communication services 131.

In a particular embodiment, the plurality of communication services 131 are services that may be offered to the user 165 of the end user communication device 109 via the operation support system 105 and provided to the end user communication device 109 via the set of transport facilities 117 by the service provider 107. The first bundle of services 133 may include services selected from the plurality of communication services 131. For example, the services (e.g., the first bundle of services 131) of the plurality of communication services 131 may include services selected from a group comprising Voice over Internet Protocol (VoIP), Internet Protocol Television (IPTV), and high speed internet access (HSIA). The second bundle of services 135 may include services selected from the first bundle of services 133. For example, the user 165 may select some or all of the services offered in the first bundle of services 133. The services that the user 165 selects may be the second bundle of services 135 that are enabled for use by the end user communication device 109. The plurality of communication services 131 may include a first additional service 137, a second additional service 139, and a modified second bundle of services 141 that includes the first additional service 137.

In a particular embodiment, the network management server 101 is configured to store the bandwidth consumption rates 119 of each of the plurality of communication services 131 at the storage device 103. The bandwidth consumption rates 119 of the plurality of communication services 131 may include estimated or actual consumption rates of bandwidth to provide one or more of the plurality of communication services 131 to the end user communication device 109 via the set of transport facilities 117. For example, the bandwidth consumption rates 119 may include an IPTV bandwidth consumption rate that indicates a prediction of bandwidth needed to provide IPTV service to the end user communication device 109. As another example, the bandwidth consumption rates 119 may include a telephone bandwidth consumption rate that indicates a prediction of bandwidth needed to provide telephone service to the end user communication device 109.

The network management server 101, in a particular embodiment, is configured to identify a location 160 of the end user communication device 109. The network management server 101 may be configured to determine the predicted bandwidth capacity 121 of the set of transport facilities 117 based on the location 160 of the end user communication device 109. The predicted bandwidth capacity 121 may be calculated based on one or more communication properties of the set of transport facilities 117, or may be based on actual or estimated data provided by another device, retrieved from the storage device, or generated by another mechanism. For example, the determination of the predicted bandwidth capacity 121 may be based on one or more physical characteristics of the communication path 151. The physical characteristics may include wire gauge, wire placement, segment length, type of wire, or other characteristics. To illustrate, a set of transport facilities (e.g., the set of transport facilities 117)



that includes FTTH may have a greater bandwidth capacity (e.g., the predicted bandwidth capacity **121**) to provide services than a set of transport facilities that include FTTC.

In response to retrieving the predicted bandwidth capacity **121**, the network management server **101** may be configured to determine the services (e.g., the first bundle of services **133**) that are capable of being provided to the user **165** based on the predicted bandwidth capacity **121**. For example, the first bundle of services **133** may include at least two services of the plurality of communications services **131**.

In a particular embodiment, the first bundle of services **133** selected by the network management server **101** to be offered to the user **165** has a total bandwidth consumption rate (e.g., the total bandwidth consumption rate **167**) that is computed based on each of the stored bandwidth consumption rates **119** corresponding to each service within the first bundle of services **133**. The total bandwidth consumption rate **167** may be less than the predicted bandwidth capacity **121** of the set of transport facilities **117**. For example, the services of the first bundle of services **133** if enabled may consume a bandwidth (e.g., the total bandwidth consumption rate **167**) that is less than the predicted bandwidth capacity **121**. To illustrate, the service provider **107** may provide the first bundle of services **133** to indicate to the user **165** all of the services that the set of transport facilities **117** is capable of providing to the end user communication device **109** without exceeding the predicted bandwidth capacity **121** of the set of transport facilities **117**. The predicted bandwidth capacity **121** may represent an estimated amount of bandwidth that may be available for the transmission of services to the end user communication device **109**.

In a particular embodiment, the network management server **101** is configured to provide a determination **147** of the first bundle of services **133** to the operation support service **105**. The determination **147** may indicate which services (e.g., the first bundle of services **133**) of the plurality of communication services **131** may be provided to the end user communication device **109** based on the predicted bandwidth capacity **121**. For example, the operations support system **105** may create an offer to the user **165** indicating that the service provider **107** is capable of providing all of the services in the first bundle of services **133**.

The network management server **101** may be further configured to receive a selection **149** of the second bundle of services **135** from the operation support service **105**. The second bundle of services **135** may be selected from the first bundle of services **133**, such as by the user **165** receiving a selection or list of selectable services and selecting one or more of the services for consumption. In response to receiving the selection **149** of the second bundle of services **135**, the network management server **101** may be configured to initiate or instruct provision of the second bundle of services **135** to the end user communication device **109**.

The network management server **101** may be configured to monitor the first bandwidth consumption rate **123** resulting from use of the second bundle of services **135** by the end user communication device **109**. The network management server **101** may be configured to use the first bandwidth consumption rate **123** to determine the measured bandwidth statistics **127**. For example, the network management server **101** may receive data from the set of transport facilities **117**, such as data corresponding to bandwidth usage at the DSLAM **113**, data representing lost packets or recent retransmission requests at the multimedia server **115**, data that is received from the end user communication device **109**, or any combination thereof. In a particular embodiment, the element man-

agement system **111** may be configured to provide the first bandwidth capacity rate **123** to the network management server **101**.

The network management server **101** may be configured to store and use the received usage data to monitor the bandwidth consumption rates resulting from the end user communication device **109** using the second bundle of services **135**. The network management server **101** may be configured to compare the predicted bandwidth capacity **121** that was used to generate the initial bundle of services **133** to the measured bandwidth statistics **127**. The network management server **101** may be configured to identify an additional bandwidth capacity (e.g., the additional bandwidth capacity **143**) of the set of transport facilities **117**, based in part on the comparison of the predicted bandwidth capacity **121** to the measured bandwidth statistics **127**. In a particular embodiment the network management server **101** is configured to determine an additional service (e.g., the first additional service **137**) to offer the user **165** of the end user communication device **109** to utilize the additional bandwidth capacity **143**.

In a particular embodiment, the network management server **101** may monitor the set of transport facilities **117** that are providing the second bundle of services **135** to the user **165**. For example, the first bandwidth consumption rate **123** may result from a use of the second bundle of services **135** by the end user communication device **109** to collect the measured bandwidth statistics **127**. In a particular embodiment, the element management system **111** may provide the first bandwidth consumption rate **123** to the network management server **101**. The network management server **101** may compare the predicted bandwidth capacity **121** to the measured bandwidth statistics **127** to identify the additional bandwidth capacity **143** of the set of transport facilities **117**. The network management server **101** may determine an additional service (e.g., the first additional service **137**) to offer the user **165** of the end user communication device **109** to utilize the additional bandwidth capacity **143**.

In a particular embodiment, the network management server **101** may provide an indication of the first additional service **137** to the operation support service **105**, which may offer the first additional service **137** to the user **165**. The first additional service **137** may be an enhancement to an existing service, such as one of the services of the second bundle of services **135**. For example, the existing service may be HSIA service at a first speed and the first additional service **137** may be HSIA service at a second speed. The operation support service **105** may provide an indication of an acceptance of the first additional service by the user to the network management server **101**. In response to receiving the user's acceptance or selection of the first additional service **137**, the network management server **101** may modify the second bundle of services **135** (e.g., the modified second bundle of services **141**) to include the first additional service **137**. In a particular embodiment, the set of transport facilities **117** is changed to support the first additional service **137**. For example, the set of transport facilities **117** may initially include a single pair of FTTH. In response to the acceptance of additional services (e.g., the first additional service **137**), the set of transport facilities **117** used to provide the modified second bundle of services to the user **165** may be upgraded from single pair FTTH to a bonded pair of FTTH. In this case, the network management server **101** may monitor a second bandwidth consumption rate **125** resulting from use of the modified second bundle of services **141** by the end user communication device **109**. By monitoring the second bandwidth consumption rate **125**, the network management server **101** may collect updated measured bandwidth statistics **129**. Monitoring



the bandwidth consumption rate may include monitoring a communication metric or figure-of-merit, such as a maximum attainable bit rate (MABR) resulting from the use of the modified second bundle of services **141**.

In a particular embodiment, the network management server **101** compares the measured bandwidth statistics **127** to the updated measured bandwidth statistics **129** to identify the updated bandwidth capacity **145** of the set of transport facilities **117**. Based on the results of the comparison, the network management server **101** may determine an additional service (e.g., the second additional service **139**) to offer the user **165** of the end user communication device **109** to utilize the updated additional bandwidth capacity **145**. The network management server **101** may provide the indication of the second additional service **139** to the operation support service **105**, which may provide to the user **165** an offer of the second additional service **139**. By offering services to the user **165** based on the predicted bandwidth capacity **121** and offering additional services based on the measured bandwidth statistics **127**, the service provider **107** may be able to increase revenues by providing more services via the set of transport facilities **117**.

Referring to FIG. 2, another embodiment of a system to provide bundled services through a communication device is illustrated and is generally designated **200**. The system **200** includes the network management server **101**, the operation support service **105**, the service provider **107**, and the end user communication device **109** described with respect to FIG. 1. The operation support system **105** includes a processor **280** and a storage medium **290**, such as a hard drive or other tangible data storage medium accessible to the processor **280**. The operation support service **105** includes a service offering module **292**, such as computer instructions executable by the service offering module **292** to select and initiate service offerings to the user **165**.

During operation, the operation support system **105** may communicate with the user **165** to offer services that may be provided to the end user communication device **109** via the set of transport facilities **117** of FIG. 1. For example, communication may be accomplished via an automated telephone system, e-mail, or any other electronic communication. To determine which services (e.g., the first bundle of services) to offer the user **165**, the operation support system **105** may retrieve the predicted bandwidth capacity **121** of the set of transport facilities **117** from the network management server **101**. Alternatively, the operation support system **105** may retrieve from the network management server **101** the determination **147** of the first bundle of services **133** to offer the user **165**.

In a particular embodiment, the operations support system **105** may transmit an offer **232** of the first bundle of services **133** to the user **165** based on the determination **147** of the first bundle of services **133**. For example, the first bundle of services **133** indicated in the offer **232** may include two services **294**. The two services **294** may include services such as IPTV service, internet service, and telephone service. In response to the offer **232**, the user **165** may select some or all of the services indicated in the offer **232**. For example, the user **165** may select IPTV service and internet service but not telephone service. The user **165** may indicate the selected services via a selection **234** of the selected services (e.g., the second bundle of services **135**).

In a particular embodiment, the operation support system **105** may provide an authorization **281** of the second bundle of services **135** to the service provider **107**. In response to receiving the authorization **281**, the service provider **107** may provide the second bundle of services **135** to the end user

communication device **109** via the set of transport facilities **117**. The network management server **101** may monitor the set of transport facilities **117** to determine the measured bandwidth statistics **127**. In a particular embodiment, the network management server **101** determines the additional bandwidth capacity based on a comparison of the measured bandwidth statistics **127** to the predicted bandwidth capacity **121**. The network management server **101** may provide the operations support system **105** with the additional bandwidth capacity **143**. Alternatively, the operations support system **105** may receive the measured bandwidth statistics **127** from the network management server **101** and determine the additional bandwidth capacity **143** based on a comparison of the predicted bandwidth capacity **121** and the measured bandwidth statistics **127**. The additional bandwidth capacity **143** may indicate that the set of transport facilities **117** has additional bandwidth capacity to provide additional services. For example, the operations support system **105** may determine the set of transport facilities **117** has sufficient bandwidth capacity to provide the first additional service **137**.

In a particular embodiment, the operations support system **105** may provide an additional offer **238** to the user **165**. The additional offer **238** may include the first additional service **137**. The user **165** may choose to add the additional service to the services (e.g., the second bundle of services **135**) provided to the end user communication device **109**. In this case, the user **165** may indicate the addition of the additional service to the operations support system **105**, in which case, the operations support system **105** may authorize the service provider **107** to provide the additional service to the end user communication device **109**. Offering the user **165** additional services (e.g., the first additional service **137**) based on the measured bandwidth statistics **127**, the service provider **107** may be able to increase revenues by providing more services via the set of transport facilities **117**, thus improving usage of the set of transport facilities **117**.

FIG. 3 is a flow diagram of a method of providing a bundle of services to a communication device and is generally designated **300**. In an illustrative embodiment, the method **300** is performed by any of the systems of FIGS. 1 and 2, or any combination thereof. The method **300** may include storing bandwidth consumption rates of a plurality of communication services in a storage device, at **302**. For example, the network management server **101** of FIG. 1 may store the bandwidth consumption rates **119** of the plurality of communication services **131** at the storage device **103**. A location of an end user communication device may be identified, at **304**. For example, the network management server **101** of FIG. 1 may identify the location **160** of the end user communication device **109**. A set of transport facilities based at least in part on the location may be retrieved, at **306**. For example, the network management server **101** of FIG. 1 may retrieve the predicted bandwidth capacity **121** of the set of transport facilities **117** based at least in part on the location **160**.

The method **300** may also include determining a first bundle of services to offer to a user of the end user communication device, the first bundle of services including at least two of the plurality of communication services, where the first bundle of services has a total bandwidth consumption rate computed based on each of the stored bandwidth consumption rates corresponding to each service within the first bundle of services, where the total bandwidth consumption rate is less than the predicted bandwidth capacity, at **308**. For example, the network management server **101** of FIG. 1 may determine the first bundle of services **133** to offer to the user **165** of the end user communication device **109**, the first bundle of services **133** including at least two of the plurality



of communication services **131**, where the first bundle of services **133** has a total bandwidth consumption rate **167** computed based on each of the stored bandwidth consumption rates **119** corresponding to each service within the first bundle of services **133**. The total bandwidth consumption rate **167** may be less than the predicted bandwidth capacity **121**.

The method **300** may also include receiving a selection of a second bundle of services, where the second bundle of services is selected from the first bundle of services, at **310**. For example, the network management server **101** of FIG. **1** may receive the selection **149** of the second bundle of services **135**, where the second bundle of services **135** is selected from the first bundle of services **133**. In a particular embodiment, the second bundle of services **135** are the services that the user **165** selects from the first bundle of services **133**. The method **300** may also include monitoring a first bandwidth consumption rate resulting from a use of the second bundle of services by the end user communication device to collect measured bandwidth statistics, at **312**. For example, the network management server **101** of FIG. **1** may monitor the first bandwidth consumption rate **123** resulting from the use of the second bundle of services **135** by the end user communication device **109** to collect the measured bandwidth statistics **127**.

The method **300** may also include comparing the first bandwidth consumption rate to the measured bandwidth statistics to identify an additional bandwidth capacity of the set of transport facilities, at **314**. For example, the network management server **101** of FIG. **1** may compare the first bandwidth consumption rate **123** to the measured bandwidth statistics **127** to identify the additional bandwidth capacity **143** of the set of transport facilities **117**. The method **300** may also include determining a first additional service to offer the user of the end user communication device to utilize the additional bandwidth capacity, at **316**. For example, the network management server **101** of FIG. **1** may determine the first additional service **137** to offer the user **165** of the end user communication device **109** to utilize the additional bandwidth capacity **143**.

Referring to FIG. **4**, an illustrative embodiment of a general computer system is shown and is designated **400**. The computer system **400** can include a set of instructions that can be executed to cause the computer system **400** to perform any one or more of the methods or computer based functions disclosed herein, such as some or all of the action of the method of FIG. **3**. The computer system **400**, or any portion thereof, may operate as a standalone device or may be connected, e.g., using a network, to other computer systems or peripheral devices.

In a networked deployment, the computer system **400** may operate in the capacity of a server. The computer system **400** can also be implemented as or incorporated into various devices, such as a personal computer (PC), a tablet PC, a personal digital assistant (PDA), a mobile device, a palmtop computer, a laptop computer, a desktop computer, a communications device, a wireless telephone, a personal trusted device, a web appliance, or any other machine capable of executing a set of instructions (sequential or otherwise) that specify actions to be taken by that machine. In a particular embodiment, the computer system **400** can be implemented using electronic devices that provide voice, video or data communication. Further, while a single computer system **400** is illustrated, the term “system” shall also be taken to include any collection of systems or sub-systems that individually or jointly execute a set, or multiple sets, of instructions to perform one or more computer functions.

As illustrated in FIG. **4**, the computer system **400** may include a processor **402**, e.g., a central processing unit (CPU),

a graphics-processing unit (GPU), or both. Moreover, the computer system **400** may include a main memory **404** and a static memory **406** that can communicate with each other via a bus **408**. As shown, the computer system **400** may further include a video display unit **410**, such as a liquid crystal display (LCD), an organic light emitting diode (OLED), a flat panel display, or a solid-state display. Additionally, the computer system **400** may include an input device **412**, such as a keyboard, and a cursor control device **414**, such as a mouse. The computer system **400** can also include a disk drive unit **416**, a signal generation device **418**, such as a speaker, and a network interface device **420**.

In a particular embodiment, as depicted in FIG. **4**, the disk drive unit **416** may include a computer-readable medium **422** in which one or more sets of instructions **424**, e.g. software, can be embedded. Further, the instructions **424** may embody one or more of the methods or logic as described herein. In a particular embodiment, the instructions **424** may reside completely, or at least partially, within the main memory **404**, the static memory **406**, and/or within the processor **402** during execution by the computer system **400**. The main memory **404** and the processor **402** also may include computer-readable media.

In an alternative embodiment, dedicated hardware implementations, such as application specific integrated circuits, programmable logic arrays and other hardware devices, can be constructed to implement one or more of the methods described herein. Applications that may include the apparatus and systems of various embodiments can broadly include a variety of electronic and computer systems. One or more embodiments described herein may implement functions using two or more specific interconnected hardware modules or devices with related control and data signals that can be communicated between and through the modules, or as portions of an application-specific integrated circuit. Accordingly, the present system encompasses software, firmware, and hardware implementations.

In accordance with various embodiments of the present disclosure, the methods described herein may be implemented by software programs executable by a computer system. Further, in an exemplary, non-limited embodiment, implementations can include distributed processing, component/object distributed processing, and parallel processing. Alternatively, virtual computer system processing can be constructed to implement one or more of the methods or functionality as described herein.

The present disclosure contemplates a computer-readable medium that includes instructions **424** or receives and executes instructions **424** responsive to a propagated signal, so that a device connected to a network **426** can communicate voice, video or data over the network **426**. Further, the instructions **424** may be transmitted or received over the network **426** via the network interface device **420**.

While the computer-readable medium is shown to be a single medium, the term “computer-readable medium” includes a single medium or multiple media, such as a centralized or distributed database, and/or associated caches and servers that store one or more sets of instructions. The term “computer-readable medium” shall also include any tangible storage medium that is capable of storing, or encoding a set of instructions for execution by a processor or that cause a computer system to perform any one or more of the methods or operations disclosed herein.

In a particular non-limiting, exemplary embodiment, the computer-readable medium can include a solid-state memory such as a memory card or other package that houses one or more non-volatile read-only memories. Further, the com-



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puter-readable medium can be a random access memory or other volatile re-writable memory. Additionally, the computer-readable medium can include a magneto-optical or optical medium, such as a disk or tapes or other storage device. Accordingly, the disclosure is considered to include 5 any one or more of a computer-readable medium and other equivalents and successor media, in which data or instructions may be stored.

In accordance with various embodiments, the methods described herein may be implemented as one or more software programs running on a computer processor. Dedicated hardware implementations including, but not limited to, application specific integrated circuits, programmable logic arrays and other hardware devices can likewise be constructed to implement the methods described herein. Furthermore, alternative software implementations including, but not limited to, distributed processing or component/object distributed processing, parallel processing, or virtual machine processing can also be constructed to implement the methods described herein.

It should also be noted that software that implements the disclosed methods may optionally be stored on a tangible storage medium, such as: a magnetic medium, such as a disk or tape; a magneto-optical or optical medium, such as a disk; or a solid state medium, such as a memory card or other package that houses one or more read-only (non-volatile) memories, random access memories, or other re-writable (volatile) memories.

Although the present specification describes components and functions that may be implemented in particular embodiments with reference to particular standards and protocols, the invention is not limited to such standards and protocols. Such standards are periodically superseded by faster or more efficient equivalents having essentially the same functions. Accordingly, replacement standards and protocols having the same or similar functions as those disclosed herein are considered equivalents thereof.

The illustrations of the embodiments described herein are intended to provide a general understanding of the structure of the various embodiments. The illustrations are not intended to serve as a complete description of all of the elements and features of apparatus and systems that utilize the structures or methods described herein. Many other embodiments may be apparent to those of skill in the art upon reviewing the disclosure. Other embodiments may be utilized and derived from the disclosure, such that structural and logical substitutions and changes may be made without departing from the scope of the disclosure. Accordingly, the disclosure and the figures are to be regarded as illustrative rather than restrictive.

One or more embodiments of the disclosure may be referred to herein, individually and/or collectively, by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any particular invention or inventive concept. Moreover, although specific embodiments have been illustrated and described herein, it should be appreciated that any subsequent arrangement designed to achieve the same or similar purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all subsequent adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the description.

In the foregoing Detailed Description, various features may be grouped together or described in a single embodiment for the purpose of streamlining the disclosure. This disclosure

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is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter may be directed to less than all of the features of any of the disclosed embodiments. Thus, the following claims are incorporated into the Detailed Description, with each claim standing on its own as defining separately claimed subject matter.

The above-disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover all such modifications, enhancements, and other embodiments, which fall within the scope of the present disclosure. Thus, to the maximum extent allowed by law, the scope of the disclosure is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

What is claimed is:

1. A method comprising:

storing bandwidth consumption rates of a plurality of communication services in a storage device;  
identifying a location of an end user communication device;  
retrieving a predicted bandwidth capacity of a set of transport facilities based at least in part on the location;  
determining a first bundle of services to offer to a user of the end user communication device, the first bundle of services including at least two communication services of the plurality of communication services, wherein the first bundle of services has a first total bandwidth consumption rate computed based on each of the stored bandwidth consumption rates corresponding to each service within the first bundle of services, and wherein the first total bandwidth consumption rate is less than the predicted bandwidth capacity;  
receiving a selection of a second bundle of services, wherein the second bundle of services is selected from the first bundle of services;  
monitoring use of the second bundle of services to collect measured bandwidth statistics, the second bundle of services used via the end user communication device;  
comparing the predicted bandwidth capacity to the measured bandwidth statistics to identify additional bandwidth capacity of the set of transport facilities;  
determining a first additional service to be offered to the user of the end user communication device to utilize the additional bandwidth capacity; and  
initiating an upgrade of at least one existing transport facility of the set of transport facilities to an upgraded transport facility based on the first additional service.

2. The method of claim 1, further comprising:

modifying the second bundle of services to include the first additional service; and  
monitoring use of the modified second bundle of services to collect updated measured bandwidth statistics, the modified second bundle of services used via the end user communication device.

3. The method of claim 2, further comprising:

comparing the measured bandwidth statistics to the updated measured bandwidth statistics to identify an updated additional bandwidth capacity of the set of transport facilities; and  
determining a second additional service to be offered to the user of the end user communication device to utilize the updated additional bandwidth capacity.

4. The method of claim 1, wherein monitoring the use of the second bundle of services includes monitoring a maxi-



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imum attainable bit rate resulting from the use of the second bundle of services, and wherein monitoring the use of the second bundle of services includes receiving a second total bandwidth consumption rate associated with the second bundle of services from an element management system. 5

5. The method of claim 1, wherein the predicted bandwidth capacity, a determination of the first bundle of services, and the measured bandwidth statistics are provided to an operational support system, and wherein selection of the second bundle of services is received from the operation support system. 10

6. The method of claim 1, wherein the set of transport facilities includes transport facilities selected from Fiber to Node, Fiber to Curb, Fiber to Home, and a digital subscriber line access multiplexer, or a combination thereof. 15

7. The method of claim 1, wherein the first bundle of services includes at least one of a Voice over Internet Protocol service, an Internet Protocol Television service, or a high speed internet access service.

8. The method of claim 1, wherein the at least one existing transport facility includes a single pair of fiber to node, wherein the upgraded transport facility includes a bonded pair of fiber to node, and wherein the upgrade of the at least one existing transport facility of the set of transport facilities to the upgraded transport facility includes replacing the single pair of fiber to node with the bonded pair of fiber to node. 20 25

9. The method of claim 1, further comprising receiving data from the set of transport facilities, wherein the data received from the set of transport facilities includes data representing lost packets, data representing recent retransmission requests, or a combination thereof. 30

10. The method of claim 1, wherein the upgrade of the at least one existing transport facility to the upgraded transport facility is initiated in response to receiving a selection of the first additional service. 35

11. The method of claim 1, wherein the upgrade of the at least one existing transport facility to the upgraded transport facility changes the predicted bandwidth capacity of the set of transport facilities.

12. A computer readable device storing processor executable instructions that, when executed by the processor, cause the processor to perform a method comprising: 40

offering a first bundle of services to a user of an end user communication device, wherein the first bundle of services includes at least two communication services of a plurality of communication services, the first bundle of services having a total bandwidth consumption rate computed based on stored bandwidth consumption rates corresponding to each service within the first bundle of services, and wherein the total bandwidth consumption rate is less than a predicted bandwidth capacity of a set of transport facilities, the predicted bandwidth capacity based at least in part on a location of the end user communication device; 45 50

receiving a selection of a second bundle of services, wherein the second bundle of services is selected from the first bundle of services; 55

authorizing the second bundle of services to be used by the end user communication device with respect to the set of transport facilities; 60

in response to an identification of an additional bandwidth capacity of the set of transport facilities, the identification based on measured bandwidth statistics corresponding to use of the second bundle of services, the second bundle of services used via the end user communication device, providing to the user of the end user communication device an indication of an additional 65

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service that is available to the end user communication device based on the additional bandwidth capacity; and initiating an upgrade of at least one existing transport facility of the set of transport facilities to an upgraded transport facility based on the additional service.

13. The computer readable device of claim 12, wherein the predicted bandwidth capacity and the measured bandwidth statistics are received from a network management server that is coupled to the set of transport facilities.

14. The computer readable device of claim 12, wherein the method further comprises offering the first bundle of services to the user automatically via at least one of e-mail or an automated telephone system.

15. A system comprising:

a set of transport facilities to enable communication between a service provider and an end user communication device,

wherein the set of transport facilities is configured in a first configuration to provide a first bundle of services to the end user communication device, the first bundle of services including at least two services selected at least partially based on a predicted bandwidth capacity of the set of transport facilities;

wherein the set of transport facilities is configured in the first configuration to provide a second bundle of services to the end user communication device, the second bundle of services selected from the first bundle of services; and

wherein the set of transport facilities is configured in a second configuration to provide a modified bundle of services to the end user communication device, the modified bundle of services including the second bundle of services and an additional service, the additional service selected at least partially based on an additional bandwidth capacity that is indicated by measured bandwidth statistics of use of the second bundle of services by via the end user communication device, and wherein a change from the first configuration to the second configuration includes upgrading at least one transport facility of the set of transport facilities to an upgraded transport facility to support the additional service.

16. The system of claim 15, wherein the set of transport facilities includes at least one digital subscriber line access multiplexer and a communication path.

17. The system of claim 16, wherein the predicted bandwidth capacity is based at least partially on a physical characteristic of the communication path, the physical characteristic of the communication path including a segment length.

18. The system of claim 16, wherein the predicted bandwidth capacity is based at least partially on a physical characteristic of the communication path, the physical characteristic of the communication path including a wire gauge.

19. The system of claim 15, wherein the set of transport facilities is coupled to at least one multimedia server of an internet protocol television system, wherein the internet protocol television system includes an access network comprising the set of transport facilities, and wherein the access network enables distribution of multimedia content from the multimedia server to a plurality of end user communication devices.

20. The system of claim 16, wherein the predicted bandwidth capacity is based at least partially on a physical characteristic of the communication path, the physical character-

istic of the communication path including a placement of a wire associated with the communication path.

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